EPA comments on the Phase II SAP
Columbia Falls Aluminum Company Superfund Site
Columbia Falls, Montana
Prepared for Columbia Falls Aluminum Company, LLC
Prepared by Roux
Dated February 28, 2018

Responses Prepared for Columbia Falls Aluminum Company, LLC by Roux
Dated April 18, 2018

General Comments Roux responses in blue. Please refer to revised Appendix A as discussed in responses.

Conclusions are frequently drawn in Section 1 without proper justification. The text requires revision such that discussion of data collected to date is unbiased, assumptions are not made, and conclusions are not implied at this stage in the Site investigation.

Section 1 provides a high-level summary of the data from the Phase I Site Characterization and refers the reader to the respective Phase I reports for details. To list all data collected to date and all results from prior data summary reports is beyond the scope of this Phase II SAP. The text in Section 2.1.1 was revised to include the following qualifying statement; "Details regarding the nature and extent of contamination, exceedances of human health and ecological screening criteria, and Phase I Site Characterization conclusions are identified in the Phase I Data Summary Report (Roux Associates, 2017a), the SLERA (Roux Associates, 2017b), and the GW/SW Data Summary Report (Roux Associates, 2017c)." Additionally, no conclusions are drawn in this SAP that were not previously stated in prior USEPA-approved data summary reports, with the exception of the temporal variability discussion that will be revised per the comments and responses provided below.

Exceedances relative to ecological screening values is missing from the discussion of nature and extent of contamination. The focus has been placed on human health and appears to use select screening values. In some cases, discussion of the most conservative screening value is not included.

The Summary of Nature and Extent of Contamination (Section 2.1.1) will be revised to include a comparison of COPC concentrations to ecological screening values and will include a discussion of the most conservative screening values. As stated in the above comment, this section provides a high-level summary of the data from the Phase I Site Characterization and refers the reader to the respective Phase I reports for details.

The sampling design and number of samples to be collected appears to be judgmental, but is not entirely clear based on portions of the text describing the utility of various sampling designs. Appendix D attempts to justify minimum sample counts needed, but the ultimate sampling design appears to invoke professional judgement in most cases. Provide clarification for how the sampling design was chosen and how it will result in adequate samples for use in site characterization and risk assessment.

The Phase II sampling locations and activities are based on a judgmental sample design. Sections 4.1 and 6.5.7 (Step 7: Develop the Plan for Obtaining Data) describes in detail the approach used to generate the sampling plan. A summary from Section 6.5.7 that describes how the sampling design was chosen and how it will result in adequate samples for use in Site characterization and risk assessment is provided below. References to other types of sampling designs (i.e. probabilistic) will be removed from the text and will note that statistical analysis of the Phase I soil data for select COPCs and COPECs was performed to inform the sample design process regarding the estimated minimum number of samples required within each exposure area to calculate UCL_{mean} concentrations.

"Although a judgmental sampling design has been utilized, the analytical approach for the baseline risk assessment will include calculation of EPCs based upon the UCL_{mean} concentrations of COPCs and COPECs. As described in Section 6.5.6.1, statistical analysis of the Phase I soil data for select COPCs and COPECs was performed to inform the sample design process regarding the estimated minimum number of samples required within each exposure area to calculate UCL_{mean} concentrations. Based upon this analysis, the Phase II soil sampling proposed for each exposure area, when combined with the Phase I locations, will result in a dataset that exceeds the estimated minimum sample size requirements for most COPCs and COPECs. In all cases, there will be at least 8 to 10 soil sample locations per exposure area, and in most cases, many more than 10.

As part of the Phase II Site Characterization, samples have been added in areas of high COPC and COPEC concentrations that were identified during the Phase I to allow for further vertical delineation of COPCs and COPECs in these areas. Additional samples are being added at random locations throughout the large undeveloped areas to obtain better spatial representativeness across each area, and to characterize COPC and COPECs concentrations near the Site boundary. Although judgmental sampling designs have been used for both the Phase I and Phase II programs; review of Plate 3 shows with addition of the Phase II samples, that random samples have been placed throughout the Site in each exposure area. Increased sample densities exist in exposure areas where industrial activities took place, and areas of the higher sample density are biased towards areas where COPCs and COPECs are considered more likely to be present. As discussed in Section, this can bias high the UCL_{mean} concentrations for some exposure areas, and will need to be considered and discussed in the uncertainty evaluation section of the risk assessment.

Judgmental sampling design has also been used to develop the Scope of Work for investigation of hydrogeologic and groundwater quality, and the surface water and sediment quality at the Site. The installation of new monitoring wells, as discussed in Section 4.6, were located based on the results of the Phase I Site Characterization to further define the extent of the groundwater quality affects in the upper hydrogeologic unit, and to address groundwater flow and media quality data gaps in certain areas of the Site. Per USEPA guidance, judgmental design is appropriate for groundwater sampling design considering the scale of the Site and lack of adequate probabilistic investigation methods. Additional surface water, sediment and sediment pore water samples have been added to achieve at least 8 to 10 locations per surface water feature."

Specific Comments

Section 1.1 (Page 1) – Because data quality objectives (DQOs) form the basis for a sampling design, it is recommended that the DQOs be presented prior to the field sampling plan (FSP).

This order of the FSP and QAAP within the Phase II SAP was consistent with Table 2-4 referenced in Sections 2.3.2.3 (Field Sampling Plan Elements) and 2.3.2.4 (Quality Assurance Project Plan Elements) of the USEPA RI-FS Guidance (USEPA, 1988), and with the Region 8 Crosswalk. The Phase II SAP was also prepared in a format consistent with the USEPA approved Phase I Site Characterization SAP (with the FSP presented before the QAPP containing the DQOs). The DQO development and their respective report sections is referenced throughout the document. Roux understands the rationale for presenting the DQOs prior to the FSP, and will commit to this revision in all future SAPs. However, we do not believe this is a critical comment to address for this Phase II SAP because all the necessary information is included and referenced throughout the document. In the essence of time to have the SAP approved prior to the field work in late April, the structure of the SAP format is proposed to stay as-is.

Table 2-4. Suggested Format for SAP (FSP and QAPP)

FSP

1. Site Background
2. Sampling Objectives
3. Sample Location and Frequency
4. Sample Designation
5. Sampling Equipment and Procedures
6. Sample Handling and Analysis

QAPP

Title Page
Table of Contents

1. Project Description
2. Project Organization and Responsibilities
3. QA Objectives for Measurement
4. Sampling Procedures
5. Sample Custody
6. Calibration Procedures
7. Analytical Procedures
8. Data Reduction, Validation, and Reporting
9. Internal Quality Control
10. Performance and Systems Audits
11. Preventative Maintenance
12. Data Assessment Procedures
13. Corrective Actions
14. Quality Assurance Reports

Section 1.1 (Page 1) – DQO development should be identified in the appropriate section as they are a key component of this document.

Section 1.1 will be revised to identify the section of the text that includes the DQO development.

Section 2.1.1 (Pages 4-6)

Soil

This section indicates that a discussion of soil and sediment is to follow, however, there is very little discussion regarding the nature and extent of contamination in sediment. Text should be added to complete this discussion.

The Soil/Sediment bullets will be revised to include a greater discussion of the nature and extent of COPCs and COPECs in sediment.

1st bullet, 1st and 2nd sentences – Please revise these sentences as such: "~~Naturally-occurring m~~ Metals were detected in soil and sediment samples across the Site. Concentrations of some metals are consistent with regional estimates of background concentrations…" (emphasis added). This bullet requires revision to remove "Naturally-occurring" because it has not been demonstrated that the metals concentrations are similar to local background concentrations. The last sentence should be strengthened to state that additional background studies *are* warranted to evaluate the metal concentrations.

The fourth bullet will be revised as suggested above to remove "naturally occurring," and the last sentence will be revised to state that the results of the Phase I Site Characterization suggest that additional background studies *are* warranted to evaluate the metal concentrations.

Groundwater

Page 5, final bullet – Please expand the discussion of VOC detections in this bullet to include locations and possible correlations between soil detections and groundwater detections.

The discussion of VOC detections in groundwater will be expanded to note the detected VOCs that exceeded the USEPA Tapwater RSL, their detection frequency, and their relationship to detections of VOCs in soil.

Surface Water

Second bullet – It is inappropriate to presume that the reason cyanide was detected in surface water samples is because the detections "may be attributable to entrained sediment in the sample". This language should be removed.

This statement simply suggests that the detections *may* be attributable to entrained sediment in the sample; as all of the samples with detections were unfiltered. During Round 4 of sampling, both filtered and unfiltered samples were collected for analysis and all samples from Cedar Creek were non-detect for cyanide. There are no conclusive statements drawn. It should be noted that this language was included in the USEPA approved GW/SW Data Summary Report, and as such, Roux did not remove this statement from the Phase II SAP section summarizing the results of the GW/SW Data Summary Report.

Third bullet – Conclusion statements regarding exceedances should be discussed relative to the most conservative screening value and perhaps the range of screening levels. It appears that selective screening values have been used in the discussion. Please revise the discussion to reflect the most conservative screening value and range of screening levels.

This bullet will be revised to include a discussion of exceedances of the most conservative screening criteria in addition to the range of screening levels provided.

Section 2.2 (Page 6) – The discussion of the Screening-level Ecological Risk Assessment (SLERA) should be expanded to include, at a minimum, what chemical classes in which media appear to be of potential concern to warrant additional investigation at the Site.

Section 2.2 will be expanded as requested and will include a summary of chemical classes identified in the SLERA that warrant additional investigation at the Site.

Section 2.4 (Page 7) - The following statement requires revision or removal, "The risk assessment work plans also provide an initial screening level evaluation of soil, groundwater, surface water, and sediment quality data from the Phase I Site Characterization program to identify COPCs and COPECs that will be evaluated in the risk assessments." The initial screening in the workplans will not be the source of the COPC and COPEC list for the upcoming baseline risk assessments. This is not in agreement with comments from EPA that COPCs and COPECs should be selected when the temporal and spatial variability at the Site has been adequately characterized.

The statement will be revised as follows, "The risk assessment work plans also provide an initial screening level evaluation of soil, groundwater, surface water, and sediment quality data from the Phase I Site Characterization program to provide a preliminary identification of COPCs and COPECs that may warrant further evaluation in the risk assessments."

Section 2.5.1(Page 7) – While it is true that the discharge recorded during Phase I displays a similar pattern when compared to years prior, it cannot be concluded with confidence that "These data indicate that the average monthly discharge patterns for 2016 and 2017 are generally consistent with the ten-year average monthly discharge pattern previously described." This statement implies that the data collected in Phase 1 represent the range of temporal variability that could be expected at the Site. Because samples were only collected for a portion of 2016, and discharge in 2016 is considerably lower than the majority of years presented in Appendix A1, conditions at the Site during drier years are yet to be characterized. The quoted statement in this comment and those similar to this comment should be removed from the document.

The quoted statement referenced above will be removed from Section 2.5.1. It should be noted that two rounds of sampling (September and December) occurred in 2016.

In addition, the discussion of temporal variability is largely focused on averages, when in fact, it is the characterization of extremes (highs and lows) that is also important. Provide text that describes an evaluation of the extremes for the Phase I-time period particular to the media type being discussed.

Appendix A was revised to allow for the discussion of temporal variability with respect to extremes (highs and lows). Appendix A1a and A1b present the discharge and daily precipitation during each Phase I Site Characterization Sampling event, and to show if any extreme discharge or precipitation took place during sampling.

Appendix A1b was revised to show brackets for each surface water sampling period completed during the Phase I, along with the discharge and daily precipitation data. The graph shows that the first few months of 2017 (January through mid-March) had low discharge, followed by a few months of high discharge from mid-March to the end of July. The low-discharge period began at the end of

July and continued through the end of the year. There was a quick increase in discharge preceded by heavy precipitation in late November to early December (i.e. snowfall).

Peak discharge, minimum discharge, and total monthly precipitation was tabulated for each month in 2016 and 2017 as shown in Appendix A2a and A2b. The data indicates that the peak discharge occurred in May 2016 and June 2017, with discharge values of 29,600 cfs and 47,000 cfs, respectively. Minimum discharge occurred in January 2016 and February 2017, with discharge values of 3,350 cfs and 3,450 cfs, respectively.

This discussion of extremes will be added to Section 2.5.1 of the Phase II SAP.

Section 2.5.2 (Page 9) – The following statement is not accurate and should be removed or revised, "Based on the results of the above evaluations, the temporal variations in the Flathead River discharge during Phase I Site Characterization were representative of the typical range of conditions for the River." This statement is not accurate because the analytical results presented in Appendix A-4 and A-5 do not span the entire year of 2016. Samples are only available for one sampling period (September) in 2016. The discharge data for 2016 indicate that 2016 was a drier year compared to others in a 10-year span. It has been demonstrated that when discharge is low, concentrations of fluoride and cyanide increase. Therefore, it cannot be concluded that the temporal variations in discharge are representative of the typical range of conditions. There is clear between-year variability and only one sampling event occurred in 2016. It is premature to state that the range of conditions has been characterized.

The quoted statement referenced above will be removed from Section 2.5.2. It should be noted that two rounds of sampling (September and December) occurred in 2016.

Section 2.5.2 (Page 9) – It is unclear why only fluoride and cyanide were included in the evaluation of temporal variability. Rationale for this selection of these chemicals needs to be added considering the conclusions that have been drawn. Can it be demonstrated that concentrations of other chemicals follow the patterns displayed for fluoride and cyanide?

Cyanide and fluoride have been identified as the primary COPCs in Site groundwater and surface water as documented in Phase I DSR, GW/SW DSR and the risk assessment work plans. Therefore, these constituents were selected for detailed review in the evaluation of temporal variability. A few introductory sentences explaining this rationale will be added to Section 2.5.2.

At this stage in the Site Characterization, Roux believes it is not necessary to supplement this analysis with other constituents since we committed to collecting two more rounds of surface water data as part of the Phase II. The temporal variability evaluation will be revisited following the collection of Phase II data in the Phase II Data Summary Report, at which point additional evaluation including graphical representations of media exceeding screening levels throughout the Site Characterization can be presented.

Section 2.5.3 (Pages 9 and 10) – Please add the evaluation of groundwater elevation temporal trends based on Phase I transducer monitoring presented in Section 4.2 of the Groundwater and Surface Water Data Summary Report.

The groundwater elevation temporal trends from Section 4.2 of the GW/SW Data Summary Report was added to the discussion in Section 2.5.3.

Section 2.5.3 (Page 10) – Inspection of Appendix A-7 indicates that in recent years (the last eight), groundwater levels were generally higher than in the period of record shown on the figure. It is unclear if this is an artifact of more frequent data collection in recent years resulting in more accurate capture of peak levels, or if groundwater levels truly are higher on a consistent basis. Provide text to clarify.

The CFMW-007 pressure transducer collected one daily measurement from 1996 through 2005; and collected measurements on an hourly basis from 2006 through 2017 (Appendix A7). Similar to the comment above, it also appears that the lowest groundwater levels were also captured during the more recent period of record. It cannot be stated with confidence if the generally higher maximum and generally lower minimum water levels for the recent years is an artifact of more frequent data collection, or if the maximum and minimum groundwater levels truly are higher or lower, respectively, on a consistent basis. It is noted that water levels from 1996 to 2009 are representative of water levels under pumping conditions during operation of the CFAC plant, and water levels from 2009 to present are based on non-pumping conditions. These changes in pumping conditions could also have an impact on historical water levels. The clarification of measurement frequency will be added to the discussion in Section 2.5.3.

Section 2.5.4 (Pages 10 and 11) – The first sentence of the fourth and final paragraphs of the section should be qualified by also stating that this is based on one year of data. The variability between years has not been characterized with the data having been collected during five quarters.

The language in these paragraphs will be revised with qualifying language to state that this is based on one year of data. Roux agrees that given that only one year of Phase I Site Characterization sampling has been conducted, the temporal representativeness of the data would be improved with additional data collection, and therefore committed to collecting two additional rounds of groundwater samples during the Phase II Site Characterization.

Section 3 (Page 12) – Data quality objectives (DQOs) should be developed and presented in Section 3 so that it is clear how the objectives for Phase II were derived. The objectives established for the Phase II characterization appear to be the goals of the investigation, where the DQOs would logically follow.

This order of the FSP and QAAP within the Phase II SAP was consistent with Table 2-4 referenced in Sections 2.3.2.3 (Field Sampling Plan Elements) and 2.3.2.4 (Quality Assurance Project Plan Elements) of the USEPA RI-FS Guidance (USEPA, 1988), and with the Region 8 Crosswalk. The Phase II SAP was also prepared in a format consistent with the USEPA approved Phase I Site Characterization SAP (with the FSP presented before the QAPP containing the DQOs). The DQO development and their respective report sections is referenced throughout the document. Roux understands the rationale for presenting the DQOs prior to the FSP, but does not believe this is a critical comment to address because all the necessary information is included and referenced throughout the SAP. In the essence of time to have the SAP approved prior to the field work in late April, the structure of the SAP format is proposed to stay as-is.

The text will be revised such that prior to the Phase II Site Characterization objectives, a statement referencing that a summary of the step-by-step DQO process followed to develop the Scope of Work and objectives for the Phase II Site Characterization field activities is provided in Section 6.5.

Section 3 (Page 12) – The second objective listed for Phase II is "Refine the list of COPCs that are most likely to drive risk management decision-making for the Site to focus and streamline the risk assessment process." COPCs will not be refined to identify risk drivers during Phase II. This refinement will occur during the development of the baseline risk assessments.

It is acknowledged that COPC refinement will not take place during the Phase II. This sentence will be revised to state, "Collect additional data to support the evaluation and refinement of COPCs which will occur during the development of the baseline risk assessments."

Section 3 (Page 12, Phase II objectives, 3rd Objective, 2nd item) – Revise the statement as such: "…and to ~~confirm the finding from~~ ***refine the understanding of groundwater conditions and temporal variability found during*** the Phase I Site characterization ~~and the temporal variability analysis discussed in Section 2.5 of this Phase II SAP~~" (emphasis added) per previous comment. Conclusions made in this document regarding temporal variability are premature given that data have only been collected from five quarters and the between year variability in discharge is apparent.

This bullet will be revised as suggested.

Section 3 (Page 13, final paragraph) – It is unclear how additional data will be used to refine the conceptual site model (CSM). Clarify what data are being collected and how they will be used for this purpose.

As described in the RI/FS Work Plan, the CSM is continually updated as needed throughout the course of the RI based upon the evaluation of new data that is being collected and reviewed. The additional data collected as part of the Phase II will be evaluated to determine if any updates to the CSM are warranted. The data being collected are outlined in the paragraphs preceding the final paragraph of Section 3.

Section 4 (Page 14, 1st paragraph) – It is unclear how a field sampling plan can be presented prior to the development of proper DQOs. It is recommended that the document be revised such that the order of presentation of the DQOs is included with the Phase II objectives in Section 3 prior to the field sampling plan.

As stated in the response to the specific comment for Section 1.1 (Page 1), the order of the FSP and QAPP within the Phase II SAP is in accordance with Table 2-4 referenced in Sections 2.3.2.3 (Field Sampling Plan Elements) and 2.3.2.4 (Quality Assurance Project Plan Elements) of the USEPA RI-FS Guidance (USEPA, 1988), and with the Region 8 Crosswalk. The Phase II SAP was also prepared in a format consistent with the USEPA approved Phase I SAP (with the FSP presented before the QAPP containing the DQOs). The DQOs development and the respective report section is referenced throughout the document. Roux understands the rationale for presenting the DQOs prior to the FSP, but does not believe this is a critical comment to address.

The last sentence of the introductory paragraph of Section 4.0 refers the reader to the report section that presents the DQOs that support the field sampling plan design.

Section 4.1 (Page 14) – The text contained within the first paragraph is internally inconsistent. It is stated that "The Phase II Site Characterization locations and numbers of sampling points associated with each type of activity will be selected based upon both professional judgmental and probabilistic sample design." Then, the text goes on to state that a judgmental sampling design will be used. Please clarify.

As stated in the above response to general comments, the Phase II sampling locations and activities are based on a judgmental sample design. References to other types of sampling designs (i.e. probabilistic) will be removed from the text and will note that statistical analysis of the Phase I soil data for select COPCs and COPECs was performed to inform the sample design process regarding the estimated minimum number of samples required within each exposure area to calculate UCL_{mean} concentrations.

Section 4.1 (Page 15-16) – The screening level sources are inconsistent with those presented in earlier site documents and require revision. Citations that are provided need to be revised to be the most recent version for each source, or dates be removed and a statement included that the most recent version will be used. For example, USEPA National Recommended Water Quality criteria is cited as "USEPA, 2004", these values are continually updated and available online, citing values from 2004 is not appropriate.

The dates will be removed from the regulatory citations and a statement will be included that the most recent version of regulatory criteria will be used for comparison. Dates will be shown for those screening level sources based on technical literature.

Section 41 (Page 15, 1st full paragraph, final sentence) – Please reference Phase I SAP Modification #4 as such: "Consistent with the sampling ***approach specified in Phase I SAP Modification #4 and*** utilized during the Phase I Site Characterization…" (emphasis added).

This sentence will be updated as written above.

Section 4.1 (Page 16) – Discussion of the evaluation of concentrations in site media compared to background requires revision or removal. Evaluation of chemical concentrations relative to background is not a component of COPC selection. The purpose of evaluating chemical concentrations relative to background is to frame the source of site risk that may be present if identified in the risk assessment.

The language will be revised as follows, "Concentrations of potential naturally occurring substances will also be compared to concentrations measured at background and upgradient sampling locations. ~~to evaluate whether the measured concentrations of those substances are related to the Site.~~ A more detailed description of the background analysis is described in Section 4.11."

Section 4.5 (Page 19, Nature and Extent of COPCs in Site Features, 1st paragraph, 5th sentence) – The sampling intervals presented includes a gap between 2 and 10 feet below land surface (bls) where no samples will be collected. Please add a sampling interval between 2 and 10 feet bls (e.g., 6 to 8 feet bls).

As presented in the Phase I Data Summary Report, Phase I investigation data indicate that COPC concentrations are greater in surface intervals and decrease with increasing soil depth. Consistent with the Phase I sampling procedures, opportunistic samples may be collected if contaminants are evident at different depths, including deeper or shallower than 10-12 ft-bls, if subsurface conditions indicate the presence of preferential pathways, or if subsurface conditions prevent sampling at the pre-determined depths.

Additionally, as stated in the draft response to the BERA WP comments, based on these vertical concentration gradients in soil, the evaluation of direct and incidental ingestion pathways within the 0-2-ft-bls interval is considered adequate and appropriate to evaluate potential exposure to burrowing terrestrial mammals in the BERA. In addition, these data will be adequate and appropriate for evaluation of potential exposure to human receptors for the exposure scenarios to be evaluated within the risk assessment. Therefore, Roux does not believe that an additional sample between 2 and 10 feet with provide additional value to the Site characterization and no changes were made to the proposed Phase II SAP sampling intervals.

Section 4.5 (Page 19) – There is discussion of additional soil sampling in Phase II that will support characterization of potential ecological and human health risk at the Site. Because discrete samples and samples collected using incremental sampling methodology (ISM) cannot be combined to compute exposure point concentrations, care needs to be taken that the appropriate sampling methodology has been selected when considering existing data at the Site and the intended purpose of newly collected data for use in EPC calculations for the given exposure areas and receptors at the Site.

This comment is acknowledged.

Section 4.5 (Page 19) – Based on the text provided, it is assumed that only one replicate will be collected from each decision unit as was done in Phase I. EPA previously commented on the shortcomings of this approach (i.e., the mean concentration may be underestimated about half of the time). It was agreed that the intention of the Phase I sampling was to identify the key chemicals of concern at the Site and identify source areas and that evaluation of the appropriateness of this approach would be completed later. In moving to Phase II, the adequacy of using only one replicate needs to be demonstrated so that continuing with this approach is justified and so that use of samples collected with this approach may be used in the risk assessments without qualification.

Roux acknowledges that the adequacy of the replicate approach must be demonstrated such that the data may be used in the risk assessments without qualification. Section 5.3.5 of the ITRC Guidance for Incremental Sampling Methodology (ISM) states, "For sites with multiple similar DUs, "batch" type replicates may be a consideration; for example, three replicates in one DU could be used to provide an estimate of variability that is extrapolated to a number of similar DUs (similar to how labs use batch replicates for determining lab analysis precision)."

All of the DUs for the ISM sampling at the Site are located within the Operational Area and have a similar conceptual site model, including similar soil type, site use/history, and expected contaminant types. Based on the guidance, Roux proposes to collect three replicates from four DUs (ten percent of the DUs) during the Phase II. Based on the results of the sampling, an estimate of variability from replicate sampling will be extrapolated to the remaining DUs. The relative standard deviation (RSD) between replicates will be calculated to assess data precision and reproducibility (and, therefore, the confidence) in the data generated. The higher the RSD the less confidence there is that the data approximates a normal distribution and that the average contaminant concentration reported accurately represents the DUs.

Section 4.5 will be revised to describe this approach.

Section 4.5 (Page 21, 5th full paragraph on page, 1st sentence): Please revise the sentence to state that the formation encountered during advancement of the entire soil boring will be described on borehole log forms in accordance with the Unified Soil Classification System (USCS).

Consistent with the Phase I Site Characterization, the formation encountered during advancement of the entire soil boring will be described on borehole log forms in accordance with the USCS. This sentence will be revised as requested.

Section 4.6 (Page 22, 1st sentence): Please revise the sentence to explain that the Phase I wells installed in the upper hydrogeologic were screened 5 to 10 feet below the water table (at time of drilling) to account for seasonal water level fluctuations, and that the new upper hydrogeologic unit wells will be installed in a consistent fashion.

Consistent with the Phase I Site Characterization, the Phase II wells installed in the upper hydrogeologic will be screened 5 to 10 feet below the water table (at time of drilling) to account for seasonal water level fluctuations. This sentence will be revised as requested.

Section 4.7 (Page 23): Please add proposed wells CFMW-066, CFMW-065, and CFWM-069 in the northerly, central-west, and westerly portions of the site to the long-term pressure transducer monitoring network to facilitate comprehensive understanding of sitewide groundwater fluctuations.

Pressure transducers will be installed in new Phase II monitoring wells CFMW-066, CFMW-065, and CFWM-069 following their development. The data obtained from these transducers will be utilized in conjunction with the existing pressure transducer network and the Site-wide gauging data to facilitate comprehensive understanding of sitewide groundwater fluctuations.

Section 4.10.1 (Page 25, 2nd paragraph) – Please revise the section to state that surface water samples will be collected from the South Percolation Ponds and Backwater Seep Sampling Area in the low water season (October/November 2018) to characterize the between-year variability during this season. The low water season in 2017 could be considered a wet year when reviewing the data presented in Appendix A. Because concentrations of certain chemicals have been shown to be higher during drier periods, data collected during the low water season in 2018 may be useful in characterizing these conditions if 2018 is a dryer year.

Roux conducted an additional seasonal variation evaluation to further assess the wet and dry conditions in 2017. Based on the evaluation below, 2017 is not considered a wet year.

Appendix A3 presents the average precipitation for the last ten years. In 2017, the yearly precipitation total was 12.44 inches, which is 22% less than the 10-year average of 16 inches of precipitation. Appendix A3 also demonstrates that the beginning of 2017 (specifically February, March, and April) were wet months with elevated precipitation when compared to the ten-year average. Although early 2017 was wet, it was also followed by a long period of low precipitation for the remainder of the year (with the exception of sporadic spikes in precipitation).

Appendix A1b was revised to show brackets for each surface water sampling period completed during the Phase I, along with the discharge and daily precipitation data. The graph shows that the first few months of 2017 (January through mid-March) had low discharge, followed by a few months of high discharge from mid-March to the end of July. The low-discharge period began at the end of July and continued through the end of the year. There was a quick increase in discharge preceded by heavy precipitation in late November to early December (i.e. snowfall).

Appendix A2b presents the daily discharge and precipitation for each day during the Phase I sampling events. As discussed in prior documents, Round 1 occurred over a few months (June, August, September) so that Site features were wet when sampled. Discharge was high during the June sampling events with an average discharge of 22,687 cfs, but low during the late August/early September event with an average discharge of 3,890 cfs. Round 2 occurred in late 2016, with an average discharge of 6,476 cfs and an average daily precipitation of 0.06 inches. Round 3 occurred in March and April 2017 with an average discharge of 14,517 cfs and a daily average precipitation of 0.1 inches. Round 4 occurred in June 2017 with an average discharge of 27,063 cfs and an average daily precipitation of 0.12 inches. The South Percolation Pond risk assessment sampling occurred in October/November 2017 with an average discharge of 3,717 cfs and an average daily precipitation of 0.06 inches.

The average discharge during the South Percolation Pond expedited risk assessment sampling was less than the 2016 and 2017 minimum discharge averages of 5,607 and 7,015, respectively (Appendix 2a). As presented in the discharge graph (Appendix A1b), there were no peaks of high discharge during this sampling event. Further, the minimum discharge in 2017 was 3,450 cfs, and the average discharge during the South Percolation Pond expedited risk assessment sampling was 3,717. These data show that the sampling occurred during a period of minimal discharge in 2017. The conditions in the Flathead River at this time are representative of a low-flow condition during a relatively dry-season.

Based on the above described evaluation, Roux does not believe that collecting additional surface water samples in the South Percolation Ponds and Backwater Seep Sampling Area is necessary in the 2018 low water season given that two rounds of low water sampling have already been performed in this area.

Section 4.12 (Page 29) – Please summarize in the section the fate and transport analytical parameters that will be analyzed for in soil samples.

The fate and transport analytical parameters to be analyzed for soil samples (including grain size distribution [sieve and hydrometer], total organic carbon, moisture content, and bulk density) will be added to this section.

Section 6.5.2 (Page 43) – Question 1 decision statement includes language that COPCs and COPECs will be selected on an exposure area basis. This is inconsistent with previous efforts to identify COPCs and COPECs. This statement should be revised to reflect that COPCs and COPECs are selected for the Site.

Question 1 decision statement will be revised to eliminate the reference to "On an exposure area basis". To clarify this decision statement, screening of COPCs will not be performed as part of the Phase II, but rather as part of the risk assessment, based upon evaluation of the complete Phase I and Phase II dataset, in accordance with the screening methods detailed in the risk assessment work plans.

Section 6.5.2 (Page 43) – Question 2 estimation statement should also include characterization of temporal variability recognizing that most of the data collected to date have been collected in a relatively wet year.

Question 2 estimation statement will be revised to state that the areal and vertical extent of COPC and COPECs in each media will be refined by addressing both the spatial and temporal data gaps identified in Section 3.0. As stated in the above comments, Roux believes the 2016 and 2017 samples were collected under conditions that reflect their respective low-water and high-water seasons.

Section 6.5.2 (Page 43) – Question 4 estimation statement should be simplified as follows: "Collect adequate samples to enable the calculation of representative EPCs for COPCs and COPECs present within each exposure area for use in subsequent human health and ecological risk evaluations".

Question 4 estimation statement will be revised as suggested.

Section 6.5.3 (Page 44) – Question 1 decision statement should specify the screening levels to be used for comparison of pore water concentrations. The RI/FS workplan is referred to as a source of screening levels, but this document does not contain values for pore water. Question 1 (Decision Statement) should also discuss consideration of temporal variability for pore water and sediment. Currently, temporal variability is only considered for groundwater and surface water.

Section 4.13 was updated to list the screening level sources for sediment porewater. As stated in the BERA Work Plan (Section 5.1.1.4), pore water data will be evaluated relative to surface water quality benchmarks for the protection of aquatic life, as well as endpoints derived based on literature/database reviews of survival, growth, and reproduction endpoints from aqueous toxicity studies for receptors potentially exposed to pore water (e.g., aquatic plants, benthic invertebrates, amphibians).

Question 1 decision statement was correspondingly updated to reference that the comprehensive results of the Phase I and Phase II sampling for each exposure area will be compared to the most recent sources of the screening criteria identified in Section 4.13 to determine if any additional constituents should be retained as COPCs and COPECs.

As discussed in Section 3.0, the total recoverable concentrations of inorganic and non-volatile organic COPECs in bulk sediment within aquatic and transitional habitats are not expected to vary seasonally in surface water features that are not connected to the groundwater system (i.e., Cedar Creek, North Percolation Ponds). Therefore, sediment and sediment porewater samples were only proposed in these features once when they are most likely to be wet during the Phase II Site Characterization.

Within the Flathead River which is subject to groundwater input, variable concentrations, if any, would be expected to be greatest during low-water season when potential COPEC inputs from groundwater are highest. As such, sediment and sediment porewater samples were only proposed in this feature during the 2018 low-water season.

The South Percolation Ponds and Backwater Seep Area (including the Riparian Channel) were sampled for sediment during the 2017 low-water season when subject to groundwater input and when concentrations would be expected to be greatest, and therefore were not proposed to be sampled for sediment again in the Phase II. Since the South Percolation Ponds and Backwater Seep Sampling Area (including the Riparian Channel) were not sampled for sediment porewater during the October/November 2017 low-water sampling event, these features will be sampled for porewater during the 2018 low-water season or when these features are most likely to be wet.

Section 6.5.2 (Page 45) – Question 4 estimation statement should include consideration of ecological receptor home ranges and how data collection will be designed to ensure adequate data are collected. It is stated that additional sampling will be conducted in each exposure area to confirm Phase I findings. It is unclear what steps will be taken if data differ from the Phase I findings and how this "confirmation" of findings will be performed.

Potential risks to small home range receptors will be evaluated in the BERA based on multiple scenarios that will conservatively estimate potential exposure via ingestion pathways. As stated in the BERA Work Plan (Section 5.2.1), potential exposure to ecological receptors will be based on a reasonable maximum exposure scenario using maximum exposure point concentrations (EPC) within each exposure area, as well as a refined exposure scenario based on the upper confidence limit of the mean (UCL_{mean}) EPCs within each exposure area. As indicated during the January 17, 2018 conference call with EPA and MDEQ and re-iterated during a follow-up conference call with EPA on January 30, 2018, potential risk to small home range receptors will also be evaluated on a point-by-point basis. Although wildlife receptors are not expected to obtain their daily dose from a single EPC at an individual sampling location, the evaluation of potential dietary exposure on a point-by-point basis will support a conservative evaluation of areas where small home range receptors may be exposed to dietary doses exceeding toxicity reference values (TRVs). Given that the judgmental study design biases sampling to areas of known or suspected sources or pathways, the incorporation of maximum and point-by-point exposure scenarios will provide conservative estimates of potential exposures to small home range receptors via ingestion pathways.

This statement will be revised to state that additional sampling will be conducted in each exposure area to "supplement" Phase I findings. These data will be analyzed qualitatively and will supplement the existing dataset in the risk assessment. If additional COPCs, potential source areas, extents of plumes are identified during the Phase II, they will be evaluated in the risk assessment.

Section 6.5.4 (Page 46) – Paragraph 2 in the discussion of temporal bounds states that collection of surface water and groundwater samples during the 2018 low-water season and high-water season "will adequately supplement the Phase I data. The combined dataset will provide a temporally representative dataset for the risk assessment." Because the meteorological conditions in the coming seasons are unknown and therefore cannot be framed relative to previous conditions, it is premature to draw these conclusions. This referred to text should be removed and replaced with a statement that the human health and ecological risk assessments will include an evaluation of data adequacy.

The first referenced sentence will be revised to remove the word "adequately," and the second referenced sentence will be removed. The adequacy of the combined Phase I and Phase II dataset will be evaluated in the risk assessment.

Section 6.5.5 (Page 47) – Fate and transport is not addressed in the development of the analytical approach. This should be added.

The analytical approach section was updated to include fate and transport (second bullet estimation statement).

Section 6.5.6.1 (Page 47) – It is stated that "A statistically rigorous analysis of decision error limits and uncertainty is generally not feasible (or valid) when implementing a judgmental sampling program." Consideration of this limitation is needed because one of the key objectives of this phase of sampling is to collect data that are adequate for risk assessment. To meet this objective, data should be collected such that a statistically rigorous analysis of decision error limits is possible.

This limitation is considered and discussed within Phase II SAP Section 6.5.6.1. The sampling design and COPC/COPEC selection approach will result in data that are adequate for the risk assessment. Section 6.5.6.1 will be revised to incorporate some of the additional points below to better explain why the data will be adequate for risk assessment and why a statistical evaluation is not being performed to support COPC/COPEC selection.

First, the Phase I and Phase II locations are generally biased to be within and around source areas, and at locations downgradient of these areas, where COPCs and COPECs would expect to be present at their highest concentrations. As part of Phase II, many more soil sampling locations have been added to increase the spatial density of samples within and around source areas where the highest COPC/COPEC concentrations should be present, as well as throughout the various undeveloped areas of the Site.

Second, the analytical approach calls for using the maximum concentration of each analyte in each exposure area, from the combined Phase I and Phase II dataset, for comparison to the most conservative screening criteria. From a statistical perspective, this analytical approach is not amenable to analysis of decision error limits that is typically associated with hypothesis testing. However, the approach is overall a conservative approach (i.e., an absolute comparison of the maximum COPC concentration to the minimum screening criteria) that minimizes the potential for a Type 1 decision error (i.e., that an analyte would be dismissed as a COPC or COPEC when it could be of potential risk). Thus, this approach to COPC selection will result in data that are adequate for the risk assessment.

It should also be noted that the analytical approach to screening of COPC/COPECs, as described above, was specified within the USEPA-approved RI/FS Work Plan.

Although not related to this specific comment; the pending Background Investigation SAP will specify statistical evaluation of decision error limits for use of comparing COPC/COPECs concentrations at the Site to concentrations observed at reference locations.

Section 6.5.6.1 (Page 47) - Question 1 decision statement should contain the tolerable limits for decision errors. The text provided simply says that there is a low possibility that COPCs will not be identified if present based on the sampling design.

Please reference the response to the comment immediately above.

Section 6.5.7 (Page 52) – The discussion of the use of a judgmental sampling design is lacking a description of the appropriateness of using this sampling design for generation of data use in a baseline human health and ecological risk assessment. While it is recognized that a judgmental sampling approach is useful in identifying COPCs and COPECs when historical site operations are generally known, it may not be appropriate for characterization of a site for a baseline risk evaluation.

As stated in the response to General Comment #3, the Phase II sampling locations and activities are based on a judgmental sample design. Sections 4.1 and 6.5.7 (Step 7: Develop the Plan for Obtaining Data) describes in detail the approach used to generate the sampling plan. A summary from Section 6.5.7 that describes how the sampling design was chosen and how it will result in adequate samples for use in Site characterization and risk assessment is provided in Comment #3.

References to other types of sampling designs (i.e. probabilistic) will be removed from the text and will note that statistical analysis of the Phase I soil data for select COPCs and COPECs was performed to inform the sample design process regarding the estimated minimum number of samples required within each exposure area to calculate UCL_{mean} concentrations.

Section 8.1 (Page 70) – Given the issues identified with previous ISM sampling, a field audit may be appropriate when future ISM sampling is conducted to ensure sampling is carried out according to the SOP. This would be most important if field personnel have changed since Phase I.

A field audit will be conducted during the Phase II ISM sampling to ensure the sampling is carried out according to the SOP. Section 8.1 was updated to reflect this additional audit.

Table 8 – The presentation of soil screening levels does not include all sources (e.g., Eco-SSLs). Also, the minimum and maximum values presented in the far-right columns do not appear to be computed properly and are missing altogether in some cases.

Table 8 will be revised as noted. The table will also be updated to fit on one page for ease of review.

Appendix D – While it is assumed that the ecological and human health benchmarks presented in the allowable error margin would be based on the minimum across the selected sources, the ecological values cannot be reproduced based on the values presented in the main text tables. Revise the main text tables and/or Appendix D as needed. For human health, the residential RSL has been included although it is not the minimum screening value for all chemicals. Rationale and justification for this approach is needed.

Ecological and human health soil benchmarks used to represent the allowable error margin (Δ) in the DQO-based minimum sample size calculations presented in Appendix D were selected based on soil criteria that are more likely to support risk-based decision-making in the BERA and HHRA than minimum soil criteria. While comparisons to minimum ecological screening values (ESVs) and minimum human health soil criteria may be used to conservatively identify COPECs and COPCs in the

BERA and HHRA, respectively, these criteria are not anticipated to support risk-based decision making for the Site. DQO-based minimum sample sizes were calculated using Δ values based on refined ecological and human health values that are conservative benchmarks to support risk-based decision-making in the BERA and HHRA.

As described in Section 2.2 of Appendix D, ecological benchmark concentrations used to estimate Δ were based on ESVs established for soil during the COPEC refinement in the BERA Work Plan (EHS Support, 2017a). BERA ESVs established in the COPEC refinement process were selected to be protective of chronic exposure to ecological receptor groups, but represent a broader range of no effect concentrations than the minimum ESVs used in the conservative screening-level ecological risk assessment (SLERA) screening process. BERA ESVs are considered conservative ecological benchmarks to support risk-based decision making in the BERA process.

Human health benchmark concentrations used to estimate Δ were based on risk-based screening criteria used in the selection of COPCs for the direct contact soil exposure pathway in the BHHRA Work Plan (EHS Support, 2017b), including the USEPA Regional Screening Levels (RSLs) for Residential Soil and MDEQ Risk-Based Screening Level (RBSL) for Residential Surface Soil. The soil-to-groundwater exposure pathway was not considered applicable as risk-based screening criteria to estimate Δ. Although groundwater potable use will be assessed in the BHHRA as a conservative scenario, there will be no future potable use of groundwater because of institutional restrictions. Therefore, human health risk-based decision-making for soil is not anticipated using soil criteria based on the soil-to-groundwater exposure pathway.

Appendix D – It does not appear that small home range ecological receptors were considered in the determination of minimum sample sizes, rather it appears to have been assumed that each exposure area is equal to what is considered a decision unit. It needs to be demonstrated that this is appropriate. If it cannot be demonstrated that this is an appropriate assumption, Appendix D requires revision to incorporate the home range size of ecological receptors.

The evaluation in Appendix D is unrelated to the size of each exposure area and is based on the statistical variability of the Phase I dataset. The evaluation assumes that the Phase I data are representative of the variability within each exposure area.

Appendix D presents statistical estimates of the minimum sample sizes needed to approximate mean constituent concentrations within a given exposure area based on a specified confidence coefficient (CC, 1-α), allowable error margins (Δ), and the statistical variation (i.e., standard deviations) observed in constituent concentrations in the Phase I Site Characterization dataset. Minimum sample size estimates were not based on the size of the exposure area. As stated in Appendix D, the spatial representativeness of data to characterize the nature and extent of soil constituents and an understanding of conceptual migration pathways from site sources are other considerations incorporated into the sampling design presented in the Phase II SAP.

Potential risks to small home range receptors will be evaluated in the BERA based on multiple scenarios as described above in response to the EPA comment referencing Section 6.5.2 (Page 45) of the Phase II SAP.